

Repertoires: A Post-Kuhnian Perspective on Collaborative Research

By: Sabina Leonelli & Rachel Ankeny

In this paper we propose a framework to describe and explain the conditions under which scientific communities do collaborative research, particularly within large- scale, multidisciplinary projects. A vast body of scholarship in the historical and social studies of science underscores the critical role of collaboration in the development of scientific knowledge. Many forms of scientific collaboration have been documented and analyzed, including co-located and dispersed, short and long- term, virtual and in-person, large and small scale, and even voluntary and involuntary. Collaboration often involves individuals with different skills, training, and goals, who are not co-located and who, even when working toward common goals, are subject to diverse institutional, cultural, and financial pressures, particularly in the contemporary context of 'big science' carried out through multidisciplinary projects occurring within international networks. It is clear from existing scholarship that research communities have variable degrees of continuity, longevity, and durability, depending on their relation to existing knowledge, materials, technologies, and institutions, as well as on the social dynamics within and beyond their boundaries. Furthermore, it is evident that the organization of research communities, and the ways in which they are constructed and managed, has a major impact on the quality and types of outputs that are produced. Hence the organization of research has been a crucial topic of interest to philosophers of science. Some philosophers have analyzed the mechanisms that underlie collaborative work, focusing particularly on the division of labor involved, the typologies and patterns of epistemic dependence characterizing interdisciplinary work which include group learning, negotiation, and integration, and the use of theories, models, and tools as conduits to communication and integration. However, there is still relatively limited philosophical work on what constitutes a research community, how communities change over time, and how the development of collaborations relates to the production of knowledge within the various social, cultural, institutional, and economic environments in which scientific research occurs. Existing characterizations of communities in terms of shared theories, which in turn constitute a discipline or field, have greatly enhanced our understanding of the dynamics of scientific change and how to conceptualize research progress' (e.g., Kuhn 1962; Toulmin 1972; Shapere 1977; Darden and Maull 1977). However, these accounts have limited value for making sense of multidisciplinary efforts, where successful collaboration involves the harmonious merging of different types of expertise and disciplinary training. They also fail to account for the critical roles played by social, political, and economic factors in the development and outcomes of scientific research practices. In this paper, we propose an alternative framework for analyzing the emergence, development, and evolution of collaborations in science that we believe will facilitate philosophical exploration of critical questions around the functioning, flexibility, durability, and longevity of research communities. We are particularly interested in tracing the material, social, and epistemic conditions under which individuals are able to join together to perform projects and achieve common goals, in ways that are relatively robust over time despite environmental and other types of changes, and can be transferred to and learnt by other communities interested in similar goals. We refer to these conditions, which include specific ensembles of skills and behaviors as well as related methods, materials, resources, participants, and infrastructures, as repertoires.

We argue that the creation or adoption of one or more repertoires has a strong influence on the identity, boundaries, and practices of research communities, whether their individual members explicitly recognize this impact or not. At the same time, not all research communities have a repertoire, and many creative and innovative scientific initiatives grow at the margins of, or in outright opposition to,

the most long-lived repertoires.

This argument builds on empirical insights by historians and philosophers of science on practices within contemporary research communities in the experimental life sciences, as well as cases drawn from social and historical studies of other sciences including physics, psychology, and medicine. We analyze the parallels and dissimilarities between our approach and philosophical discussions of scientific change, and discuss in detail the characteristics, composition, and performative nature of repertoires. We then reflect on what it means for a repertoire to be resilient and transferrable, the relationship between repertoires and research communities, and the significance of the alignment of repertoire components in terms of their success (or failure). Finally, we discuss the scope of repertoires and their potential utility as methodological frameworks for philosophers to reconstruct and compare scientific strategies and developments across time, space, cultures, and disciplines.